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PATENT

AMENDMENT A (IN RESPONSE TO PAPER NO. 080504  
(OFFICE ACTION DATED AUGUST 8, 2004))

CLAIMS

1. (ORIGINAL) An apparatus including a low power differential amplifier powered by a plurality of unequal power supply voltages, comprising:  
a first power supply terminal to convey a first power supply voltage having a first voltage magnitude;  
a second power supply terminal to convey a second power supply voltage having a second voltage magnitude which is less than said first voltage magnitude;  
telescopic differential amplifier circuitry, coupled to said first power supply terminal, that responds to reception of said first power supply voltage and an input differential signal by providing an intermediate differential signal corresponding to said input differential signal; and  
voltage follower circuitry, coupled to said second power supply terminal and said telescopic differential amplifier circuitry, that responds to reception of said second power supply voltage and said intermediate differential signal by providing an output differential signal corresponding to said intermediate differential signal.

2. (ORIGINAL) The apparatus of claim 1, wherein said telescopic differential amplifier circuitry comprises:  
a first circuit branch including a first signal transistor and a first bias transistor coupled in series that responds to said first power supply voltage by conveying a portion of a predetermined current;  
a second circuit branch including a second signal transistor and a second bias transistor coupled in series that responds to said first power supply voltage by conveying another portion of said predetermined current; and  
current source circuitry, coupled to said first and second circuit branches, that responds to said first power supply voltage by conveying said predetermined

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current.

3. (ORIGINAL) The apparatus of claim 1, wherein said voltage follower circuitry comprises:

a first transistor that responds to said second power supply voltage by conveying a first predetermined current;

first current source circuitry, coupled to said first transistor, that responds to said second power supply voltage by conveying said first predetermined current.

a second transistor that responds to said second power supply voltage by conveying a second predetermined current; and

second current source circuitry, coupled to said second transistor, that responds to said second power supply voltage by conveying said second predetermined current.

4. (ORIGINAL) The apparatus of claim 3, wherein said first and second predetermined currents are substantially equal.

5. (ORIGINAL) The apparatus of claim 1, wherein:  
said telescopic differential amplifier circuitry, responsive to said first power supply voltage, has a first common mode output voltage associated therewith;  
said voltage follower circuitry, responsive to said second power supply voltage, has a second common mode output voltage associated therewith; and  
said first and second common mode output voltages differ by a predetermined amount.

6. (ORIGINAL) The apparatus of claim 5, wherein said low power differential amplifier further comprises bias circuitry, coupled to said telescopic differential amplifier circuitry and said voltage follower circuitry, that responds to

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reception of said first and second common mode output voltages by providing at least one bias signal such that said predetermined amount is approximately zero.

7. (ORIGINAL) The apparatus of claim 1, wherein:

said first power supply terminal is further to convey a first power supply current having a first current magnitude;

said second power supply terminal is further to convey a second power supply current having a second current magnitude, wherein said first current magnitude is less than said second current magnitude;

said telescopic differential amplifier circuitry responds to reception of said first power supply voltage, said first power supply current and said input differential signal by providing said intermediate differential signal; and

said voltage follower circuitry responds to reception of said second power supply voltage, said second power supply current and said intermediate differential signal by providing said output differential signal.

8. (ORIGINAL) The apparatus of claim 7, wherein:

said telescopic differential amplifier circuitry, responsive to said first power supply voltage, has a first common mode output voltage associated therewith;

said voltage follower circuitry, responsive to said second power supply voltage, has a second common mode output voltage associated therewith; and

said first and second common mode output voltages differ by a predetermined amount.

9. (ORIGINAL) An apparatus including a low power differential

amplifier powered by a plurality of unequal power supply voltages, comprising:

first power means for conveying a first power supply voltage having a first voltage magnitude;

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second power means for conveying a second power supply voltage having a second voltage magnitude which is less than said first voltage magnitude;

differential amplifier means for receiving said first power supply voltage and an input differential signal and responding thereto by generating an intermediate differential signal corresponding to said input differential signal; and

voltage follower means for receiving said second power supply voltage and said intermediate differential signal and responding thereto by generating an output differential signal corresponding to said intermediate differential signal.

10. *(ORIGINAL)* The apparatus of claim 9, wherein

said differential amplifier means is further for receiving said first power supply voltage and responding thereto by generating a first common mode output voltage;

said voltage follower means is further for receiving said second power supply voltage and responding thereto by generating a second common mode output voltage; and

said low power differential amplifier further comprises biasing means for receiving said first and second common mode output voltages and responding thereto by generating at least one bias signal such that said first and second common mode output voltages are substantially equal.

11. *(CANCELLED)*

12. *(CURRENTLY AMENDED)* ~~The apparatus of claim 11, wherein said first amplifier circuitry comprises:~~ An apparatus including a low power differential amplifier powered by a plurality of unequal power supply voltages, comprising:

\_\_\_\_\_ a first power supply terminal to convey a first power supply voltage having

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a first voltage magnitude and a first power supply current having a first current magnitude;

\_\_\_\_\_ a second power supply terminal to convey a second power supply voltage having a second voltage magnitude and a second power supply current having a second current magnitude, wherein said first voltage magnitude is greater than said second voltage magnitude and said first current magnitude is less than said second current magnitude;

\_\_\_\_\_ first amplifier circuitry, coupled to said first power supply terminal, that responds to reception of said first power supply voltage, said first power supply current and an input differential signal by providing an intermediate differential signal corresponding to said input differential signal, and includes

        a first circuit branch that responds to said first power supply voltage by conveying a portion of a predetermined-current; current,

        a second circuit branch that responds to said first power supply voltage by conveying another portion of said predetermined current; current, and

        current source circuitry, coupled to said first and second circuit branches, that responds to said first power supply voltage by conveying said predetermined current; current; and

\_\_\_\_\_ second amplifier circuitry, coupled to said second power supply terminal and said first amplifier circuitry, that responds to reception of said second power supply voltage, said second power supply current and said intermediate differential signal by providing an output differential signal corresponding to said intermediate differential signal.

13. (CURRENTLY AMENDED) The apparatus of claim 11, wherein said second amplifier circuitry comprises: An apparatus including a low power differential amplifier powered by a plurality of unequal power supply voltages, comprising:

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\_\_\_\_\_ a first power supply terminal to convey a first power supply voltage having a first voltage magnitude and a first power supply current having a first current magnitude;

\_\_\_\_\_ a second power supply terminal to convey a second power supply voltage having a second voltage magnitude and a second power supply current having a second current magnitude, wherein said first voltage magnitude is greater than said second voltage magnitude and said first current magnitude is less than said second current magnitude;

\_\_\_\_\_ first amplifier circuitry, coupled to said first power supply terminal, that responds to reception of said first power supply voltage, said first power supply current and an input differential signal by providing an intermediate differential signal corresponding to said input differential signal; and

\_\_\_\_\_ second amplifier circuitry, coupled to said second power supply terminal and said first amplifier circuitry, that responds to reception of said second power supply voltage, said second power supply current and said intermediate differential signal by providing an output differential signal corresponding to said intermediate differential signal, and includes

        a first transistor that responds to said second power supply voltage by conveying a first predetermined current;

        first current source circuitry, coupled to said first transistor, that responds to said second power supply voltage by conveying said first predetermined current;

        a second transistor that responds to said second power supply voltage by conveying a second predetermined current; and

        second current source circuitry, coupled to said second transistor, that responds to said second power supply voltage by conveying said second predetermined current.

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14. (ORIGINAL) The apparatus of claim 13, wherein said first and second predetermined currents are substantially equal.

15. (CURRENTLY AMENDED) ~~The apparatus of claim 11, wherein:~~  
An apparatus including a low power differential amplifier powered by a plurality of unequal power supply voltages, comprising:  
\_\_\_\_\_ a first power supply terminal to convey a first power supply voltage having a first voltage magnitude and a first power supply current having a first current magnitude;  
\_\_\_\_\_ a second power supply terminal to convey a second power supply voltage having a second voltage magnitude and a second power supply current having a second current magnitude, wherein said first voltage magnitude is greater than said second voltage magnitude and said first current magnitude is less than said second current magnitude;  
\_\_\_\_\_ first amplifier circuitry, coupled to said first power supply terminal, that responds to reception of said first power supply voltage, said first power supply current and an input differential signal by providing an intermediate differential signal corresponding to said input differential signal; and  
\_\_\_\_\_ second amplifier circuitry, coupled to said second power supply terminal and said first amplifier circuitry, that responds to reception of said second power supply voltage, said second power supply current and said intermediate differential signal by providing an output differential signal corresponding to said intermediate differential signal;  
\_\_\_\_\_ wherein  
\_\_\_\_\_ said intermediate differential signal has an intermediate signal magnitude; magnitude,  
\_\_\_\_\_ said output differential signal has an output signal magnitude;  
\_\_\_\_\_ magnitude, and

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said intermediate and output signal magnitudes are substantially equal.

16. ~~(CURRENTLY AMENDED)~~ The apparatus of claim 11, wherein:
- An apparatus including a low power differential amplifier powered by a plurality of unequal power supply voltages, comprising:
- \_\_\_\_\_ a first power supply terminal to convey a first power supply voltage having a first voltage magnitude and a first power supply current having a first current magnitude;
- \_\_\_\_\_ a second power supply terminal to convey a second power supply voltage having a second voltage magnitude and a second power supply current having a second current magnitude, wherein said first voltage magnitude is greater than said second voltage magnitude and said first current magnitude is less than said second current magnitude;
- \_\_\_\_\_ first amplifier circuitry, coupled to said first power supply terminal, that responds to reception of said first power supply voltage, said first power supply current and an input differential signal by providing an intermediate differential signal corresponding to said input differential signal; and
- \_\_\_\_\_ second amplifier circuitry, coupled to said second power supply terminal and said first amplifier circuitry, that responds to reception of said second power supply voltage, said second power supply current and said intermediate differential signal by providing an output differential signal corresponding to said intermediate differential signal;
- \_\_\_\_\_ wherein
- said first amplifier circuitry, responsive to said first power supply voltage, has a first common mode output voltage associated therewith; therewith,
- said second amplifier circuitry, responsive to said second power supply voltage, has a second common mode output voltage associated therewith;

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said first and second common mode output voltages differ by a predetermined amount.

17. *(ORIGINAL)* The apparatus of claim 16, wherein said low power differential amplifier further comprises bias circuitry, coupled to said first amplifier circuitry and said second amplifier circuitry, that responds to reception of said first and second common mode output voltages by providing at least one bias signal such that said predetermined amount is approximately zero.

18. *(CANCELLED)*

19. *(CURRENTLY AMENDED)* ~~The apparatus of claim 18, wherein~~  
An apparatus including a low power differential amplifier powered by a plurality of unequal power supply voltages, comprising:  
\_\_\_\_\_ first power means for conveying a first power supply voltage having a first voltage magnitude and a first power supply current having a first current magnitude;  
\_\_\_\_\_ second power means for conveying a second power supply voltage having a second voltage magnitude and a second power supply current having a second current magnitude, wherein said first voltage magnitude is greater than said second voltage magnitude and said first current magnitude is less than said second current magnitude;  
\_\_\_\_\_ first amplifier means for receiving said first power supply voltage, said first power supply current and an input differential signal and responding thereto by generating an intermediate differential signal corresponding to said input differential signal, and said first amplifier means is further for receiving said first power supply voltage and responding thereto by generating a first common mode

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output voltage;

second amplifier means for receiving said second power supply voltage.  
said second power supply current and said intermediate differential signal and  
responding thereto by generating an output differential signal corresponding to said  
intermediate differential signal, and said second amplifier means is further for  
receiving said second power supply voltage and responding thereto by generating a  
second common mode output voltage; and

~~said low power differential amplifier further comprises biasing means for~~  
receiving said first and second common mode output voltages and responding  
thereto by generating at least one bias signal such that said first and second  
common mode output voltages are substantially equal.

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